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First Five-Year Review Report
For
McCormick and Baxter Creosoting Company Superfund Site
Portland, Multnomah County, Oregon

ORD009020603

September 2001

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I. Introduction

The Oregon Department of Environmental Quality (DEQ) has conducted the first five-year review of the remedial actions (RAs) implemented at the McCormick and Baxter Creosoting Company Superfund Site ("the Site") located in Portland, Multnomah County, Oregon. This review was conducted by DEQ as the lead agency for the Site and is provided to the U.S. Environmental Protection Agency (EPA) for concurrence. The review was supported by DEQ's Contractor, Ecology and Environment, Inc. (E & E).

This report documents the results of the five-year review. The purpose of five-year reviews is to determine whether the selected remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify deficiencies found during the review, if any, and recommendations to address them.

This review is required by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, and Section 300.430(f)(4)(ii) of the National Oil and Hazardous Substances Contingency Plan (NCP). CERCLA Section 121(c), as amended, states:

> If the President selects a remedial action that results in hazardous substances, pollutants, or contaminants remaining at the Site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the first five-year review for the Site. Construction was initiated on May 31, 1996 at the Interim Groundwater Operable Unit (OU) at the Site. Because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unrestricted use and unlimited exposure, a five-year review is required.

II. Site Chronology

In 1983, E & E performed a site inspection for the EPA, Region 10, under the Zone II Field Investigation Team contract. In August 1983, McCormick and Baxter Creosoting Company (M & B) performed a preliminary site investigation (AquaResources, Inc. 1983) and notified DEQ of possible off-site releases near the former waste disposal area (FWDA). Subsequently, CH2M Hill was retained by M & B to perform a site investigation, which was completed in 1985. The investigation report concluded that soil

and groundwater contamination existed at the Site, but that no emergency actions were necessary to protect off-site populations (CH2M Hill 1985, 1987).

On November 24, 1987, a Stipulation and Final Order was signed by M & B and DEQ, requiring the firm to perform specified RA activities. Not all of these requirements were completed by the time the facility was closed on October 10, 1991. DEQ conducted a remedial investigation/feasibility study (RI/FS) from September 1990 to September 1992 (PTI 1992a, 1992b).

In 1993, DEQ issued a proposed cleanup plan; however, DEQ elected not to finalize the plan because of the pending addition of the Site to the National Priorities List (NPL). DEQ instead began to implement several interim remedial measures, which were elements of the 1993 DEQ proposed plan, while awaiting a final decision from the EPA regarding inclusion of the Site on the NPL. The EPA added the Site to the NPL on June 1, 1994.

Since completion of the RI/FS in 1992, DEQ has conducted several interim remedial measures and additional site characterization. Based on implementation and/or completion of the interim remedial measures, collection of additional site data since the 1992 FS, and experience gained at other wood-treating sites, DEQ chose to revise the 1992 FS to incorporate new data and updated remedial alternatives. The revised FS report (PTI 1995) describes the updated RA alternatives for the Site and incorporates the interim remedial measures conducted since the 1992 FS.

A new proposed plan describing DEQ and EPA's preferred remedy was issued on October 30, 1995. The public comment period began on November 6, 1995, and ended on January 15, 1996. A public meeting was conducted on November 28, 1995. After considering the comments received during the public comment period, EPA, with DEQ concurrence, issued the record of decision (ROD), specifying the selected remedy, in March 1996. DEQ conducted public meetings on April 23 and May 29, 1996, to discuss the ROD and the selected remedy. The ROD was amended in March 1998 to revise the soil remedy from on-site treatment to off-site disposal.

III. Background

A. Site Characteristics

The Site is located on the Willamette River in Portland, Oregon, downstream of Swan Island and upstream of the St. John's Bridge (Figure 1). The Willamette River flows to the northwest in the vicinity of the Site. The Site is located on an area that was constructed by placement of dredged material in the early 1900s. The Site, which encompasses approximately 43 acres on land and 15+acres in the river, is generally flat and lies between a 120-foot (ft) high bluff along the northeastern border and a 20-ft high bank along the Willamette River to the southwest. A sandy beach is exposed at the base of the bank except during brief periods of high river stage (generally late winter or early spring). The Site is bordered by industrial properties along the river and by a residential

area on the bluff. A Burlington Northern Railroad (BNRR) spur (approximately 7,500 linear ft) crosses the western portion of the property. The entire perimeter of the M & B property is fenced, and warning signs are posted on the fence.

M & B began wood-treating operations in 1944 that continued until October 10, 1991. Four retorts at the Site were used for different wood-treatment processes, which included creosote in oils, pentachlorophenol (PCP) in aromatic oils, water based treatment (i.e., chromium and ammoniacal copper arsenate and ammoniacal copper zinc arsenate [ACZA]), and Cellon (PCP in liquid butane and isopropyl ether).

Between 1950 and 1965, waste oil containing creosote and/or PCP was applied to site soil for dust suppression in the central process area. Liquid process wastes were reportedly discharged to a low area near the tank farm prior to 1971. Contaminated soil was removed from this area in the mid-1980s. From 1968 to 1971, process wastes were disposed of in the FWDA (Former Waste Disposal Area) in the western portion of the Site.

The Site had a wastewater discharge outfall (Outfall 001) that was used for cooling water when the plant was operating. Contact wastewater was also discharged from this outfall in the early years of operation. Three storm water outfalls (002, 003, and 004) were also present along the river. Outfalls 001 and 002 were permitted under NPDES. Following plant shutdown, DEQ placed earthen berms around storm water collection sumps at the Site as an early response action to minimize off-site discharge. The storm water outfalls were decommissioned during the 1998 RA soil removal. Currently, storm water at the Site infiltrates into the subsurface.

B. Source Areas

Three main contaminant source areas exist at the Site:

- The FWDA - located at the western corner of the Site adjacent to the Willamette River.
- The central process area - the former location of the retorts, PCP mixing shed, and ACZA storage areas.
- The tank farm area (TFA) - located in the central area of the Site that is the former location of the main tank farm, the large creosote tank, and several other wood treatment process-related tanks or process areas.

Other source areas include the southeast disposal trench area, located southeast of the TFA, which received overflow of oily wastes from the system pits and tank farm; miscellaneous small waste disposal areas; and monitoring well MW-1 located near the entrance to the property. Figure 2 presents the current site configuration and source areas.

Land use at the Site has been industrial since the 1940s. Future reuse of the Site could include industrial or recreational scenarios with appropriate institutional controls (e.g.,

deed restrictions). Development of an industrial area is proposed at the former Riedel International property to the southeast, and development of a greenspace park is proposed by the Metropolitan Service District at the Willamette Cove property to the northwest. In July 2001, the City of Portland issued a resolution (Resolution No. 36010) endorsing the recommendations of the *McCormick and Baxter Site Reuse Assessment: Final Report*, to develop a park on the property for active and passive recreation. The city intends to pursue acquisition and development of the property. Established railroad rights-of-way are on two sides of the Site. The area on top of the bluff is anticipated to remain residential.

IV. Remedial Actions

EPA and DEQ signed the ROD for the Site in March 1996, with an Amended ROD for soil disposal in March 1998. The overall goal of the RAs for the Site is to protect human health and the environment from contaminated soil, sediment, and groundwater while allowing future use of the Site for industrial or recreational purposes.

A. Remedial Action Objectives and Remedy Selection

Soil Operable Unit
The Remedial Action Objectives (RAOs) identified for soils are:

- The ROD specified RAOs for soil to prevent human exposure through direct contact or incidental ingestion to contaminated surface and near-surface soil that would result in an excess lifetime cancer risk above 1 x 10^{-6} for individual compounds; above 1 x 10^{-5} for additive carcinogenic compounds; or above a Hazard Index (HI) of 1 for noncarcinogenic compounds in an industrial land use scenario.
- Preventing storm water run-off containing contaminated soil from reaching the Willamette River.

The soil cleanup goals specified in the ROD were for arsenic at 8 milligrams per kilogram (mg/kg), PCP at 50 mg/kg, carcinogenic polynuclear aromatic hydrocarbons (PAHs) at 1 mg/kg, and dioxin/furans at 0.00004 mg/kg. The selected remedy for soil consists of the following major elements:

- Demolition of site structures and miscellaneous debris;
- Soil excavation and handling of contaminated soil exceeding treatment action levels;
- Soil treatment of the most highly PAH- and PCP-contaminated soil (a ROD Amendment in 1998 changed the soil disposition to off-site Subtitle C landfill);
- Installation of a site cap placed over all soil at the Site that exceeds risk-based or background concentrations;
- Monitoring activities including sampling of soil to define the extent of soil to be treated and to verify that soil exceeding the treatment action levels have been excavated for treatment. In addition, air monitoring during soil excavation to

ensure that airborne contaminants do not pose a threat to site workers and off-site residential populations; and

- Institutional/access controls which include perimeter fencing, warning signs and safety measures until completion of the RA.

Groundwater Operable Unit

Because of the extensive nonaqueous phase liquid (NAPL) contamination, it is not technically practicable to restore the groundwater aquifers under the Site to drinking water quality; therefore, site-specific contaminant concentration limits that are protective of the environment were developed. These protective alternate concentration limits (ACLs) were developed in accordance with CERCLA Section 121(d)(2)(B)(ii) for dissolved contaminants in groundwater discharging to the Willamette River. Section 121 provides that ACLs may be used at a Superfund site when:

- Groundwater has a known projected point-of-entry to subsurface water;
- There is no significant increase in contaminant concentrations in the surface water at the discharge point or any point where contaminants are expected to accumulate; and
- There are measures such as institutional controls that prevent human exposure to groundwater contaminants that are above health-based levels.

DEQ and EPA determined in the ROD that these provisions of CERCLA have been met for the dissolved constituents in groundwater at the Site. Further, DEQ and EPA determined in the ROD that active restoration of the aquifers to non-zero Maximum Contaminant Level Goals (MCLGs) or Maximum Contaminant Levels (MCLs) is technically impracticable due to the extensive NAPL contamination of the saturated zone beneath the Site and the river sediment. DEQ and EPA also determined that the risk from potential degradation products in the groundwater can be managed through institutional controls, and that no significant increase of their degradation compounds have been found in surface water and no significant increase of contaminants will occur in sediment from groundwater. The ACLs were established to protect aquatic organisms based on EPA/DEQ water quality criteria and will not result in statistically significant increases of contaminant concentrations above background in the Willamette River.

Dissolved-phase groundwater contamination in the shallow aquifer at the Site is associated with NAPL plumes migrating from the TFA and former waste disposal areas. The ROD specified ACLs for total PAHs at 43 milligrams per liter (mg/L), PCP at 5 mg/L, dioxins/furans at 2×10^{-7} mg/L and arsenic, chromium, copper, and zinc at 1 mg/L. The RAOs for groundwater and NAPL contamination at the Site include:

- Preventing human exposure to or ingestion of groundwater with contaminant concentrations in excess of federal and state drinking water standards or protective levels;
- Minimizing further vertical migration of NAPL to the deep aquifer;
- Preventing groundwater discharges to the Willamette River that contain dissolved contaminants that would result in contaminant concentrations within

the river in excess of background concentrations or in excess of water quality criteria for aquatic organisms;
- Minimizing NAPL discharges to the Willamette River beach and adjacent sediment to protect human health and the environment; and
- Removing mobile NAPL to the extent practicable to reduce the continuing source of groundwater contamination and potential for discharge to Willamette River sediment.

The remedy for groundwater consists of the following major elements:

- Enhancing NAPL recovery using pure-phase extraction and/or groundwater/NAPL extraction;
- Evaluation by pilot testing of innovative technologies, such as surfactant flushing, to increase the effectiveness and the rate of NAPL removal;
- Treatment of groundwater using methods such as dissolved air flotation, filtration, carbon absorption, extended aeration/packed bed bioreactor, or other biological treatment;
- Discharging of treated groundwater to the Willamette River in accordance with substantive NPDES requirements;
- Treating and/or disposing of NAPL and other treatment residuals in accordance with applicable hazardous waste regulations off site;
- Monitoring to ensure that site-specific ACLs are met at compliance monitoring locations;
- A contingency to install a vertical physical barrier in the event that:
  - The mobile NAPL cannot be reliably controlled using hydraulic methods; or
  - It improves the overall cost-effectiveness of the groundwater remedy.

  (Installation of a vertical physical barrier is currently being evaluated); and
- Installation of controls that restrict groundwater use at the Site.

Sediment Operable Unit

Sediment contamination in the Willamette River is primarily associated with NAPL migrating from the TFA and FWDA, although some sediment contamination in the area of the former creosote loading dock may be from historic spills associated with unloading operations. RAOs for sediment were developed to protect indigenous sediment-dwelling organisms and to prevent human exposure through direct contact. The ROD-specified remedial goals for river sediment for arsenic are at 12 mg/kg, PCP at 100 mg/kg, carcinogenic PAHs at 2 mg/kg, and dioxins/furans at 0.008 mg/kg. The RAOs for sediment include:

- Preventing humans and aquatic organisms from direct contact with contaminated sediment; and
- Minimizing releases of contaminants from sediment that might result in contamination of the Willamette River in excess of federal and state ambient water quality criteria.

The selected remedy for sediment consists of the following major elements:

- Sampling of surface and near-surface sediment to determine contaminant concentrations and the level of attenuation of contaminant concentrations and toxicity since completion of the RI sediment monitoring and plant closure in 1991;
- Collection of hydrodynamic data for the Willamette River necessary for effective cap design for control of cap erosion;
- Coordinating the timing of the placement of the cap with the effectiveness evaluation of the groundwater remedy;
- Long-term monitoring of the cap and surrounding areas following installation; and
- Maintaining institutional controls to ensure the cap's integrity.

B. Remedial Progress

Soil Operable Unit

The soil remedy is currently under construction; an initial phase of soil removal has been completed, and capping of the Site soil is scheduled for design and construction following implementation of the groundwater remedy. During Phase I of the soil remedy, soil contaminated above action levels and within the top four feet of site soil was excavated and all remaining unused site features were demolished from February to May 1999. Phase II will complete the soil remedy with the installation of the soil cap currently scheduled for 2003 or 2004.

Phase I of the soil remedy consisted of the following major elements:

- Soil and debris excavation and off-site disposal as hazardous waste: 33,771 tons.
- Building demolition, creosote dock/log loader structure demolition, utility pole/pilings removal, and disposal as nonhazardous waste.
- Railroad track and scrap metal salvage: 580 tons.
- Placement of backfill from off-site source: 33,128 tons.
- Concrete structure demolition and on-site consolidation as backfill: 4,747 cubic feet.
- Salvage of railroad ties: 195 tons.

Miscellaneous tasks included asbestos abatement, poly-tank dismantling, site entrance road rehabilitation, reconfiguration of production wells to monitoring wells, and hydro seeding. Because of the large quantity of materials and convenient site access to rail lines and the Willamette River, transportation of hazardous waste was limited to rail and backfill was delivered by barge.

Groundwater Operable Unit

As discussed previously, the groundwater remedy consists of several components including the enhancement of a groundwater and NAPL extraction, treatment, and monitoring system that was installed and in operation as an Interim Action at the time of ROD issuance. The ROD provided that this "interim groundwater" system would

undergo upgrading and enhancements to attain the full functional ability in meeting the groundwater RAOs for the Site. These enhancements were completed in 1998. However, the cleanup goals for the Site have not yet been achieved, as discussed below.

The principal components of the interim groundwater system include:

- Installation of an interceptor trench downgradient from the TFA to recover light nonaqueous-phase liquid (LNAPL);
- Installation and monitoring of groundwater wells to further delineate the extent of NAPL contamination;
- Recovery of NAPL from extraction and monitoring wells; and
- Design, construction, and operation of a pilot treatment system to treat NAPL-contaminated groundwater.

A pilot-scale wastewater treatment system was installed at the Site in an effort to separate NAPL and treat groundwater removed through total fluid extraction efforts in the TFA. In addition, pure-phase NAPL extraction was performed in the TFA and FWDA. Wells in the FWDA were used for pure-phase NAPL extraction only as groundwater was not extracted. The FWDA wells were not connected to the pilot-scale treatment system in the TFA.

The goal of the NAPL extraction was to remove and deplete the NAPL pools to residual levels (to the extent possible) to minimize or prevent active migration into the sediments and the Willamette River. The residual level (percentage of NAPL left in pores) necessary to totally prevent pool migration is unknown. However, wells were pumped (either through total fluids or pure-phase extraction) until visible oil was not present in the discharge. Wells were monitored periodically after that time to assure that an active pool had not re-accumulated at a given well location. Monitoring showed no significant re-accumulations of NAPL at the wells.

During 1998, treatment system modifications were completed in the TFA. Before this time, total fluids extracted from three wells were conveyed to the former pilot treatment system and treated by a dissolved air flotation (DAF) system. This system required extensive technician oversight and was expensive to operate (e.g., chemical costs). The system operated 40 hours per week (Monday through Friday) when the technician was on site to perform O&M activities. To allow for continuous operation and to reduce costs and operator requirements, the system was replaced with a system resembling that employed in the FWDA. The "new" system (hereafter referred to as "TFA treatment system") consists of an oil/water separator, an in-line anthracite/clay filter, two granular activated carbon (GAC) units, and a metals treatment unit.

As discussed in the ROD, the overall objective of the enhanced NAPL removal is to capture mobile NAPL in the immediate vicinity of the extraction wells, and not necessarily to maintain hydraulic control of NAPL site-wide. In 1999 and 2000, it was observed that the volume of NAPL extracted by the automated systems was similar to the volume removed via manual extraction using skimmers. In addition, the manual

extraction can be conducted for approximately half the cost of operating the automated systems ($180,000 per six months vs. $90,000 for six months). In September 2000, both the FWDA and TFA NAPL extraction systems were shutdown, and NAPL extraction continues to be conducted manually.

The currently operating components of the groundwater remedy include groundwater and NAPL monitoring, manual NAPL extraction and passive skimmer extraction of LNAPL.

Based on recent semi-annual groundwater sampling, the ACLs for the Site are being met. However, enhanced NAPL extraction is only effective in the immediate area of the extraction wells. The groundwater remedy does not control mobile NAPL nor hydraulically contain dissolved-phase contamination.

NAPL discharges to the river sediment have not been controlled as determined by visual observations of seeps at the river edge. Therefore, the contingency for a vertical barrier wall is being considered to give additional assurance that NAPL will not re-contaminate the river sediments.

The ROD states that a physical barrier may be installed if the following or similar conditions are met:

- The NAPL pools cannot be contained reliably using hydraulic methods. Evidence of this may include exceedance of ACLs, accumulations of NAPL in compliance monitoring points, or continued occurrence of seeps along the beach; or
- The incremental cost for installation of the barrier results in a proportional decrease in the long-term costs of hydraulic control of the pool areas through decreases in the volume of groundwater to be extracted and treated.

The DEQ and EPA are currently evaluating the potential installation of a vertical barrier wall. If it is determined that a wall should be installed, the remedial design is anticipated to be completed by Fall/Winter of 2001, with construction in the Spring of 2002 pending the availability of EPA funding.

Sediment Operable Unit

The selected remedy for sediment is currently in the remedial design phase. A Preliminary Basis of Design Report has been completed and an Intermediate (65%) Design will be initiated in September 2001. Several components of the remedy have been completed including:

- Sampling of surface and near-surface sediment to determine contaminant concentrations and the level of attenuation of contaminant concentrations and toxicity since completion of the RI was conducted in 1999 and 2001;
- Collection of hydrodynamic data for the Willamette River necessary for effective cap design for control of cap erosion was completed in 2001;

- Coordination in the timing of the placement of the cap with the effectiveness evaluation of the groundwater remedy is occurring. The consideration of the vertical barrier wall implementation reflects this ongoing coordination.

The remedial design is currently scheduled for completion in the Summer of 2002, with construction anticipated to be completed during the in-water work windows in late 2002 or early 2003.

V. Five-Year Review Process

This is a CERCLA statutory five-year review triggered by the issuance of the ROD and implementation of the interim remedial action for groundwater in 1996. The soil and sediment remedies are in progress and the DEQ maintains an ongoing presence at the Site. The groundwater/NAPL extraction system (a component of the groundwater remedy) is currently being evaluated for effectiveness and a barrier wall contingency will likely be implemented. The five-year review has been conducted by DEQ with support from its Contractor, E & E. The five-year review is provided to EPA for concurrence. The primary team members include Kevin Parrett (the DEQ Project Manager), John Montgomery (E & E's Project Manager) and Alan Goodman (the EPA Remedial Project Manager).

This five-year review includes several tasks including document review, an assessment of protectiveness including regulatory standards review, and a review of recent data relative to RAOs and regulatory standards. No community involvement activities took place as a specific part of this review; however, DEQ continues to provide general community outreach as discussed below. Notice of the availability of this five-year review report will be provided to the community after the report is issued.

VI. Five-Year Review Findings

Because the RAs for the OUs at the Site are ongoing, an active presence is maintained at the Site and frequent interaction occurs between involved agencies. In addition, community involvement is ongoing via scheduling of regular public meetings and distribution of public notices and media releases. Therefore, no interviews were specifically scheduled for this review. Input was sought from various personnel within DEQ who have been involved with the Site since the RI/FS. A site inspection was also not deemed necessary due to ongoing site presence.

Access controls were instituted at the Site in 1996 and have continued to date. These controls include securing the Site with a seven-foot chain-link fence and locking security gates to prevent unauthorized access to the Site. A security gate is in place at the top of Edgewater Street, the primary vehicular access route to the Site. A security alarm system with dial-up alerting capabilities is in place in the event of a break-in to site buildings. Warning signs with contact names and phone numbers are placed at each gated entrance as well as along the riverfront.

Shallow groundwater beneath the Site is not used. Water for site use is obtained via city water mains and piping leading onto the Site from the southeast.

A Site Safety and Health Plan is in place and is enforced for all ongoing site O & M activities. As specific site activities are planned for implementation (e.g., sediment cap installation), an activity-specific safety and health plan will be developed.

The information reviewed for this report includes the ROD, the Amended ROD, and a series of reports produced during the remedial design phase and ongoing RA reporting. These documents include:

- *Phase I Soil Remedial Action Summary Report*, November 1999;
- *Sediment Remedial Design Final Sampling Data Summary Report*, February 2001; and,
- *Remedial Actions Semi-Annual Report, January 2001 through June 2001*, August 2001.

Relevant standards were also reviewed to determine if any changes had occurred relative to site cleanup levels. There have been no changes to promulgated standards that affect the protectiveness of the cleanup levels. However, because the cleanup levels are risk-based ACLs, risk methods and TBCs were also reviewed.

A. Soil Operable Unit

As described previously, the Soil OU remedial action is in progress, with the initial phase of demolition and debris removal and soil excavation and disposal completed in 1999. In accordance with the ROD, the most highly contaminated soil on the site was excavated to a minimum depth of 4 feet and removed from the site for disposal. In addition, all remaining unused site features were demolished to prepare the site for cap installation. The *Phase I Soil RA Summary Report* prepared in 1999 indicates that the ROD requirements for remediating contaminated site soil exceeding action levels was achieved. In the major source areas where excavation proceeded to depths of 8 feet to 10 feet, the potential for future contact was reduced further. The cap installation is currently scheduled for completion in 2003 or 2004 following completion of the groundwater and sediment remedy.

B. Groundwater Operable Unit

The Site groundwater is currently monitored on a semi-annual basis, generally in April and October, with reports covering each six month period. A selection of perimeter wells is sampled and analyzed for cleanup parameters. In addition to documenting groundwater concentrations, the report documents NAPL extraction volumes, groundwater elevations and gradient, and site operations information.

A review of the most recent report indicates that contaminant concentrations in groundwater at selected perimeter monitoring wells remain below ACLs. However,

NAPL continues to be present in numerous other wells that are monitored but not routinely sampled. Wells that contain measurable NAPL are included in the manual (bailer) or passive (skimmer) extraction process. Over the past year, there has been no DNAPL measured in any of the site wells, and LNAPL has been intermittently increasing or decreasing in various wells with no discernible pattern. In addition, NAPL seeps along the river's edge both in front of the Site and in the adjacent Willamette Cove area have been increasingly observed over the past year. Contributing factors may include the relatively low Site water levels and low river stage associated with a regional drought in 2000/2001, leading to a corresponding exposure of seep horizons and increased gradient toward the river. Seeps with visible sheen are controlled with an in-water boom and absorbent pads. This is typically a seasonal concern; when the water stage increases, the seeps are no longer visible. The cold river water and shallowing gradient may inhibit continued seepage.

The Groundwater ACLs were established to protect aquatic organisms based on EPA/DEQ water quality criteria. While there have been no changes to promulgated standards, there have been revisions to water quality criteria. Table 1 provides for comparison the ACLs, the National Recommended Water Quality Criteria (NRWQC), and the sample results from representative site monitoring wells. Surface water sample results are also provided. Both the surface water and well concentrations are below both the ACLs and the NRWQC.

C. Sediment Operable Unit

As previously described, implementation of the Sediment OU remedy is currently in progress. Several RD data collection activities have been completed as the design is being prepared. These have included:

- Surface and near-surface sediment to determine contaminant concentrations and the level of attenuation of contaminant concentrations and toxicity since completion of the RI;
- Coring and geotechnical analyses to determine slope stability and cap placement requirements; and,
- Bathymetric surveying and hydraulic modeling to determine necessary engineering design parameters.

Sediment sampling was conducted in 1999 and late 2000 and indicated a slightly larger area requiring capping than in the ROD (16.2 acres vs. 15 acres). Although sediment contaminant concentrations still exceeded sediment cleanup goals, in most areas they had generally decreased in the top six inches. In addition, samples were collected from a large enough area that a residual risk assessment can be prepared to demonstrate that the area outside the cap does not present unacceptable risk. This demonstration will be provided as support of the Intermediate Design of the sediment cap.

There are still no promulgated standards for sediment that would be considered an ARAR, although the EPA, DEQ and other agencies are working on various criteria and

sediment quality guidelines (e.g., as part of the Portland Harbor Superfund Investigation). In addition, since the ROD in 1996 several of the evolutionarily significant units (ESUs) of the Willamette River have become either listed or are proposed for listing under the Endangered Species Act (ESA) (50 CFR 17.11 and 17.12). These include ESUs of Chinook, Steelhead, and Coho for listed, proposed and candidate species. While these listings do not impose specific standards, potential impacts to these ESUs are being considered.

As presented above, Table 1 provides a comparison of Willamette River surface water concentrations in the proposed site cap area as well as monitoring well concentrations from perimeter wells. All results for the surface water samples are below both the ACLs and the NRWQC for both acute and chronic exposure to aquatic life. Well samples were generally below ACLs but the NRWQC criterion for naphthalene was exceeded in a well downgradient of the TFA area. This suggests that relatively mobile naphthalene while present onsite is not necessarily leaving the upland area of the site and impacting surface water above water quality criteria.

VII. Assessment

The following conclusions support the determination that the remedies selected at the McCormick and Baxter site are expected to be protective of human health and the environment upon completion of the remedial actions.

A. Is the remedy functioning as intended by the decision documents?

Institutional and access controls were instituted at the Site in 1996 and have continued to date. These controls include securing the Site with a seven-foot chain-link fence and locking security gates to prevent unauthorized access to the Site. A security gate is in place at the top of Edgewater Street, the primary vehicular access route to the Site. A security alarm system with dial-up alerting capabilities is in place in the event of a break-in to site buildings. Warning signs with contact names and phone numbers are placed at each gated entrance as well as along the riverfront. These controls are monitored on a weekly basis and repaired immediately if found to be compromised. Trespassing has been reduced significantly, although not totally eliminated.

Shallow groundwater beneath the Site is not used. Water for site use is obtained via city water mains and piping leading onto the Site from the southeast. Access to monitoring wells is controlled by the security fencing and gates.

Institutional controls such as deed restrictions, environmental easements or restrictive covenants will be set forth in an EPA and DEQ approved form upon completion of the remedial actions and prior to potential site re-use. DEQ retains a first mortgage on the property as a result of past cleanup costs. The property owner has cooperated with DEQ in obtaining site access agreement and in other site related activities. It is expected that DEQ will be involved in any decisions regarding re-use of the property and that institutional controls will be implemented as a requirement for re-use.

A Site Safety and Health Plan is in place and is enforced for all ongoing site O & M activities. As specific site activities are planned for implementation (e.g., sediment cap installation), an activity-specific safety and health plan will be developed.

Soil Operable Unit
The soil remedy has been initiated and the initial phase of removal and site preparation has been successfully completed. Upon completion of the soil cap placement and additional institutional controls, it is expected that the performance standards specified in the ROD will be met.

Groundwater Operable Unit
The groundwater/NAPL extraction systems have been successful in removing NAPL. For example, 300 gallons of NAPL were recovered last year. The systems have been enhanced to optimize recovery of NAPL and minimize the amount of groundwater extracted. In the past year, the automated systems were shut down in favor of manual or passive extraction, which achieved similar results with lower costs.

While the groundwater/NAPL extractions systems have been successful in recovering NAPL, mobile NAPL has continued to move as evidenced by seeps along the riverfront. The contingency for a vertical barrier wall included in the ROD is in evaluation and likely will be implemented following public notice and pending the availability of EPA funding. After installation of a wall, the current extraction system and well network will be re-evaluated and potentially adjusted for optimum performance. Once this is in place, the performance standards for the groundwater OU are expected to be met.

The remedy for the groundwater OU includes evaluation by pilot testing of innovative technologies, such as surfactant flushing, to increase the effectiveness and rate of NAPL removal. This evaluation has not yet taken place because of the potential of increasing NAPL flow to the river. It is anticipated that innovative technologies will be evaluated after installation of the barrier wall.

Sediment Operable Unit
Additional beach warning signs are being placed in areas where seeps develop or become exposed as the river level drops. Completion of the barrier wall is expected to reduce potential NAPL migration toward the river and into sediments. Upon completion of the sediment cap placement and additional institutional controls (e.g., access restrictions), it is expected that the performance standards specified in the ROD will be met.

B. Are the assumptions used at the time of the remedy selection still valid?

Soil Operable Unit
As mentioned above institutional/access controls are in place as is a Site Safety and Health Plan (SSHP). These controls are reviewed and revised as necessary (e.g., fence repairs or SSHP revisions for specific RA activities). The soil remedy has been initiated and the initial phase of contaminated soil removal and site preparation has been

successfully completed. The ROD assumption that cleanup goals would be protective of future recreational use of the site is still valid.

Groundwater Operable Unit
The ROD specified ACLs for groundwater based on a dilution model. The ACLs have not been exceeded in surface water sampling. In addition, as described in Section VI, the surface water concentrations also do not exceed NRWQC levels for aquatic life. The presence of mobile dissolved phase contaminants in on-site wells but not in surface water samples suggests that dissolved phase contaminants are not substantially leaving the uplands area toward the river and/or substantial dilution occurs within the river immediately adjacent to the site. However, NAPL continues to migrate and periodically discharge to the Willamette River and Willamette Cove. There are no other changes in exposure pathway or contaminant characteristics. Upon completion of the barrier wall placement, re-evaluation of the NAPL extraction system, and additional institutional controls, it is expected that the performance standards specified in the ROD will be met.

Sediment Operable Unit
For the Sediment OU, the RAOs were established to prevent direct human contact with sediment contaminated above health-based goals, and to prevent exposure of benthic organisms to sediment above known toxicity levels. The ROD assumed that benthic organisms would be the most sensitive endpoint and bioassay criteria were used. While there are still no established standards for sediment, further protection of aquatic life shall be considered during design and implementation of the sediment cap. In addition, as noted in the previous section, ESA considerations for salmonids as well as Portland Harbor concerns are also being addressed in the design (e.g., an evaluation of residual risk is planned during the design phase).

In conclusion, the assumptions utilized in the ROD remain valid. However, standards and criteria are currently being developed as a result of ESA considerations and the Portland Harbor Superfund listing. These standards and criteria will be considered as part of the next five-year review.

C. Has any other information come to light that could call into question the protectiveness of the remedy?

The occurrence of visible NAPL seeps along the riverfront has required interim response actions in the form of boom placement and additional hazard warning signs. This apparent increase in observable seeps is likely due to historically low water levels in the river and on site. DEQ believes that implementation of both the barrier wall and sediment cap will eliminate the threat to human health and the environment as intended by the selected remedy. The NAPL seeps will continue to be monitored and additional response actions may be implemented to mitigate any immediate threat.

The remedies selected for the operable units (Soil, Groundwater and Sediment) are still expected to be protective of human health and the environment upon completion of the remedial actions. At this time, DEQ does not know of any additional threats that will not

be addressed by the selected remedy or the elements to be determined during the remedial design process. There are no new immediate threats that should be addressed sooner than the selected remedies for this site will be implemented.

VII. Deficiencies

Based on the remedial action objectives for soil, groundwater and sediment, there are no areas of noncompliance for the Site. The current response action to the NAPL seeps is sufficient to mitigate immediate threats and will be further addressed by completion of the selected remedies for sediment and groundwater.

IX. Recommendations and Followup Actions

Based upon the ongoing presence of agency personnel and review of periodic reports submitted by DEQ's oversight contractor, DEQ has determined that the remedies for soil and groundwater currently in progress are performing as designed and necessary operation and maintenance of the remedies is being performed. Surface and near-surface soil has been excavated and replaced with clean fill. Direct access to the Site is restricted by chain-link fencing. Placement of the soil cap will complete the Soil OU remedy as intended and there are no additional recommendations for the Soil OU at this time.

NAPL thickness in individual monitoring and extraction wells has decreased significantly since the interim remedial action for groundwater was initiated. Shallow groundwater use restrictions have been implemented at the Site. DEQ recommends that an evaluation of installing a vertical physical barrier at the Site be performed because of the continuing migration of NAPL to river sediments. This evaluation is being conducted at this time. If this contingency is approved, the wall design is expected to begin in September 2001 with construction in the Spring 2002 if EPA funding is available.

For the Sediment OU, with the additional consideration towards recent ESA and Harbor issues, there are no additional recommendations at this time.

X. Statements of Protectiveness

The remedy at the Soil OU is expected to be protective of human health and the environment upon completion, and immediate threats have been addressed. The Phase I soil removal removed the most highly contaminated soil and removed unused site features and debris. A Site Safety and Health Plan and access controls are in place and properly functioning. Upon completion of cap installation and implementation of final institutional controls (e.g., deed restrictions or administrative controls) the soil remedy shall be complete and the cleanup goals will be met.

The remedy for the Groundwater OU is expected to be protective of human health and the environment upon completion, and immediate threats have been addressed. The NAPL extraction system has been successful at recovering NAPL and the quantities have declined substantially since implementation of the interim extraction systems. Because

there appears to be mobile NAPL moving toward the river, the barrier wall contingency identified in the ROD is being evaluated and will likely be implemented. Access to groundwater on the site is controlled and not available for public use. The groundwater cleanup goals are expected to be met and the groundwater remedy will be complete following construction of the barrier wall (and continued NAPL extraction) and evaluation of innovative technologies.

The remedy at the Sediment OU is expected to be protective of human health and the environment upon completion, and immediate threats have been addressed. Recent sediment sampling verified the extent of contamination to be generally consistent with previous RI sampling. NAPL seeps are continuing and appear to be related to groundwater levels and river stage that are at historic lows and duration. Immediate threats from seeps are controlled by in-water boom placement, and hazard warning signs have been added in the observed seep areas. These seeps are expected to be eliminated or significantly reduced following construction of the barrier wall and the sediment cap.

XI. Next Five-Year Review

This is a statutory site that requires five-year reviews. The next five-year review will be conducted prior to June 30, 2006.

XII. Documents Reviewed

Ecology and Environment, Inc., August 2001, *Remedial Actions Semi-annual Report, Reporting Period: January 1, 2001 through June 30, 2001, McCormick & Baxter Creosoting Company, Portland Plant,* submitted to Oregon Department of Environmental Quality (DEQ), Portland, Oregon.

———, February 2001, *Sediment Remedial Design Final Data Summary Report, McCormick & Baxter Creosoting Company, Portland Plant*, submitted to DEQ, Portland, Oregon.

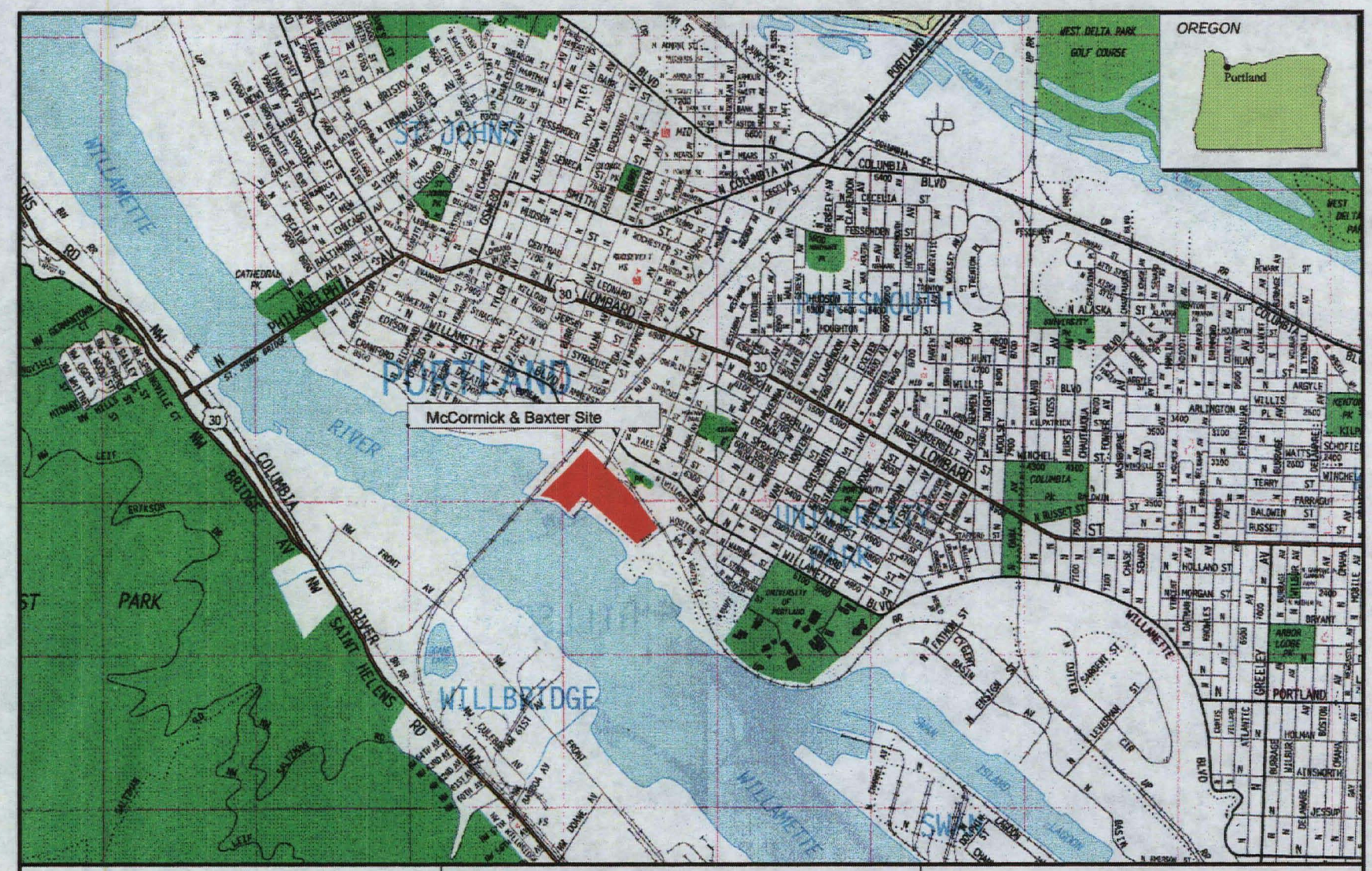
———, November 1999, *Phase I Soil Remedial Action Summary Report, McCormick & Baxter Creosoting Company, Portland Plant*, submitted to DEQ, Portland, Oregon.

Oregon Department of Environmental Quality, 1999, *Portland Harbor Sediment Management Plan*, Portland, Oregon.

United States Environmental Protection Agency (EPA), March 1996, *Record of Decision (ROD), McCormick & Baxter Creosoting Company, Portland Plant, Portland, Oregon.*

———, March 1998, *Amended Record of Decision (ROD), McCormick & Baxter Creosoting Company, Portland Plant, Portland, Oregon.*

———, April 1999, *National Recommended Water Quality Criteria – Correction*, Office of Water, EPA 822-Z-99-001.



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Portland, Oregon

McCORMICK & BAXTER CREOSOTING CO.
PORTLAND, OREGON

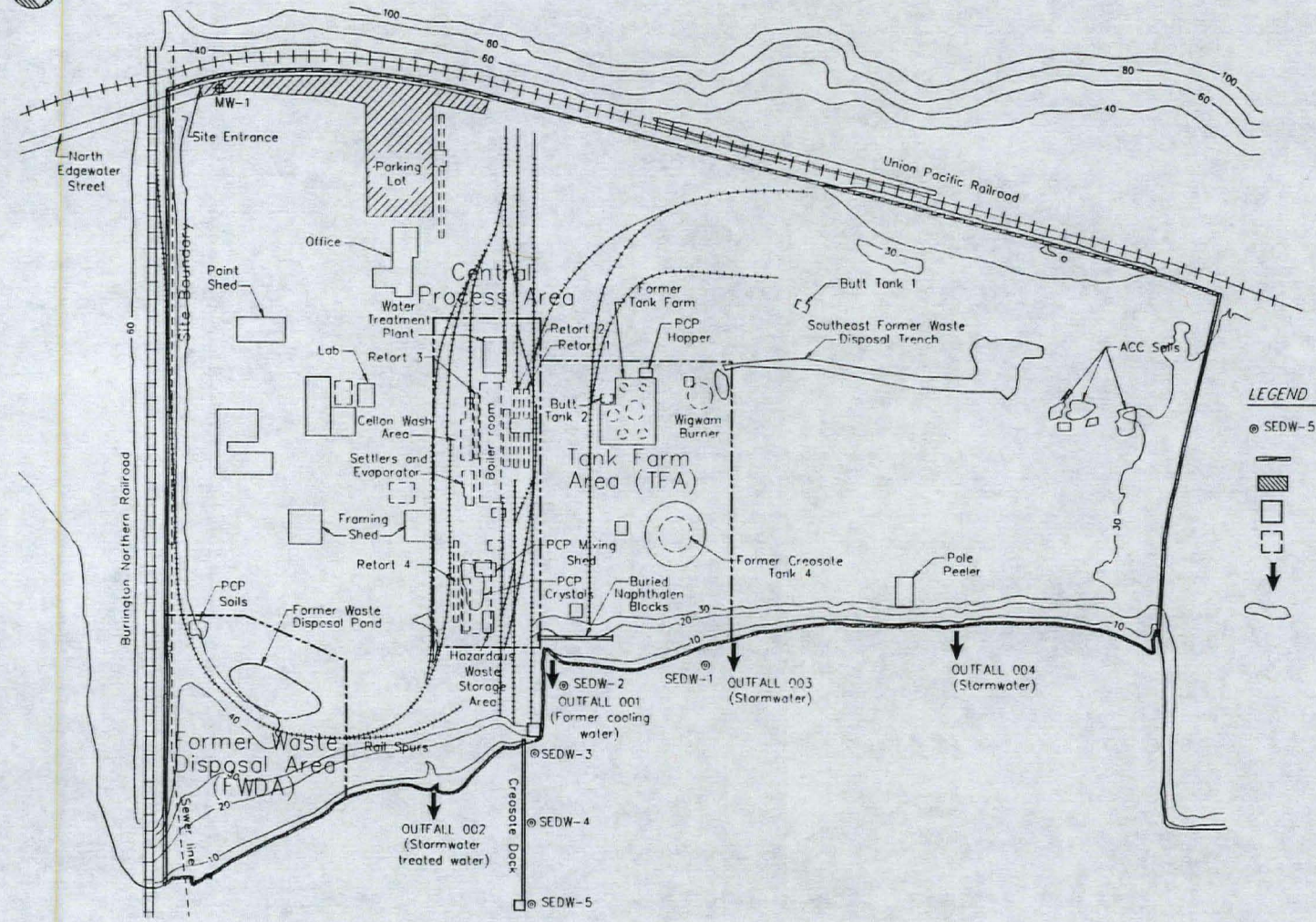
FIGURE 1

SITE LOCATION MAP

0 .25 .5
Approximate Scale in Miles

Drawn By:	Date	TDD/Job No.	Dwg. No.
AES	12-9-98	OH4270	OH4270F22

OT9110/connors/OT92-2A2.DWG/11-21-96/SEATTLE,WA./AUTOCAD OPR ED MARTIN



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DESIGNED BY E. MARTIN
CHECKED BY: K. SMITH
DRAWN BY E.MARTIN
APPROVED BY D.ANDERSON/K.SMITH

FIGURE 2
SITE CONFIGURATION
PRE-1998 SOIL REMOVAL
McCORMICK & BAXTER
CREOSOTING CO.
PORTLAND, OREGON

SCALE	DATE ISSUED	CAD FILE NO.	DRAWING NO.
NOTED	4-01-01	OT92-2A.DWG	X OF X

Table 1

COMPARISON OF SAMPLING ANALYTICAL RESULTS WITH RECORD OF DECISION AND NATIONAL RECOMMENDED WATER QUALITY CRITERIA
McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON
(Micrograms per Liter)

Analyte	Alternative Cleanup Level[1] For Groundwater	United States Environmental Protection Agency National Recommended Water Quality Criteria (April 1999 Update) Listed For Protection of Aquatic Life		Sediment Remedial Design Sampling (October 1999)	SemiAnnual Groundwater Monitoring Selected Shallow Perimeter Well Locations (April 2001)		
		Fresh Acute Criteria	Fresh Chronic Criteria	Maximum Concentration in Surface Water	MW-LRs (Downgradient of TFA)	MW-35s (Adjacent to Willamette Cove)	MW-25s (Downgradient of the FWDA)
PAHs							
Total PAHs	43,000	Not listed	Not listed	3.0	2,400	Not detected	312
Naphthalene	Not listed	2,300[2]	620[2]	1.1	2,310	0.1 U	171
Acenaphthene	Not listed	1,700[2]	520[2]	1.2	64.5	0.1 U	89.9
Benzo(a)anthracene[3]	Not listed	Not listed	Not listed	0.1 U	0.14	0.1 U	0.1 U
Other Organic Compounds							
Pentachlorophenol	5,000	19	15	1 U	1 U	1 U	1 U
2,3,7,8 TCDD TEQ	0.0002	Not listed	Not listed	Not analyzed	0.0000483	Not analyzed	0.0000478
Metals							
Arsenic	1,000	340	150	2 U	1.18	1 U	16.5
Chromium (III)	1,000	570[4]	74[4]	Not analyzed	1 U	1 U	1 U
Copper	1,000	13[4]	9.0[4]	Not analyzed	2 U	2 U	2 U
Zinc	1,000	120[4]	120[4]	Not analyzed	5 U	5 U	5 U

Notes:
[1] Alternative Cleanup Level, as listed in the United States Environmental Protection Agency Record of Decision.
[2] Criteria for naphthalene and acenaphthene not listed in National Recommended Water Quality Criteria (April 1999 update); values listed from OAR-340-041 (Table 20).
[3] Criteria for protection of aquatic life not listed; National Recommended Water Quality Criteria (April 1999 update) lists a criteria of 0.49 µg/L for protection of human health for fish consumption only.
[4] Hardness dependent criteria (100 milligrams per liter used). Note hardness is not measured in groundwater samples collected at McCormick & Baxter Creosoting Company site.

Key:
FWDA = Former waste disposal area.
µg/L = micrograms per liter.
PAHs = Polynuclear aromatic hydrocarbons.
TFA = Tank farm area.
2,3,7,8 TCDD TEQ = 2,3,7,8-tetrachlorodibenzo-p-dioxin toxic equivalency factor.
U = Compound analyzed for, but was not detected; the corresponding value is the maximum reporting limit for the analyte.